Using AirMSPI to elucidate absorbing aerosols from imagery in the field

Mike Tosca,
Mike Garay, Mike Bull, David Diner

OBJECTIVE

- Develop a simple algorithm that can be used in the field to identify and detect the presence of absorbing aerosols (smoke)

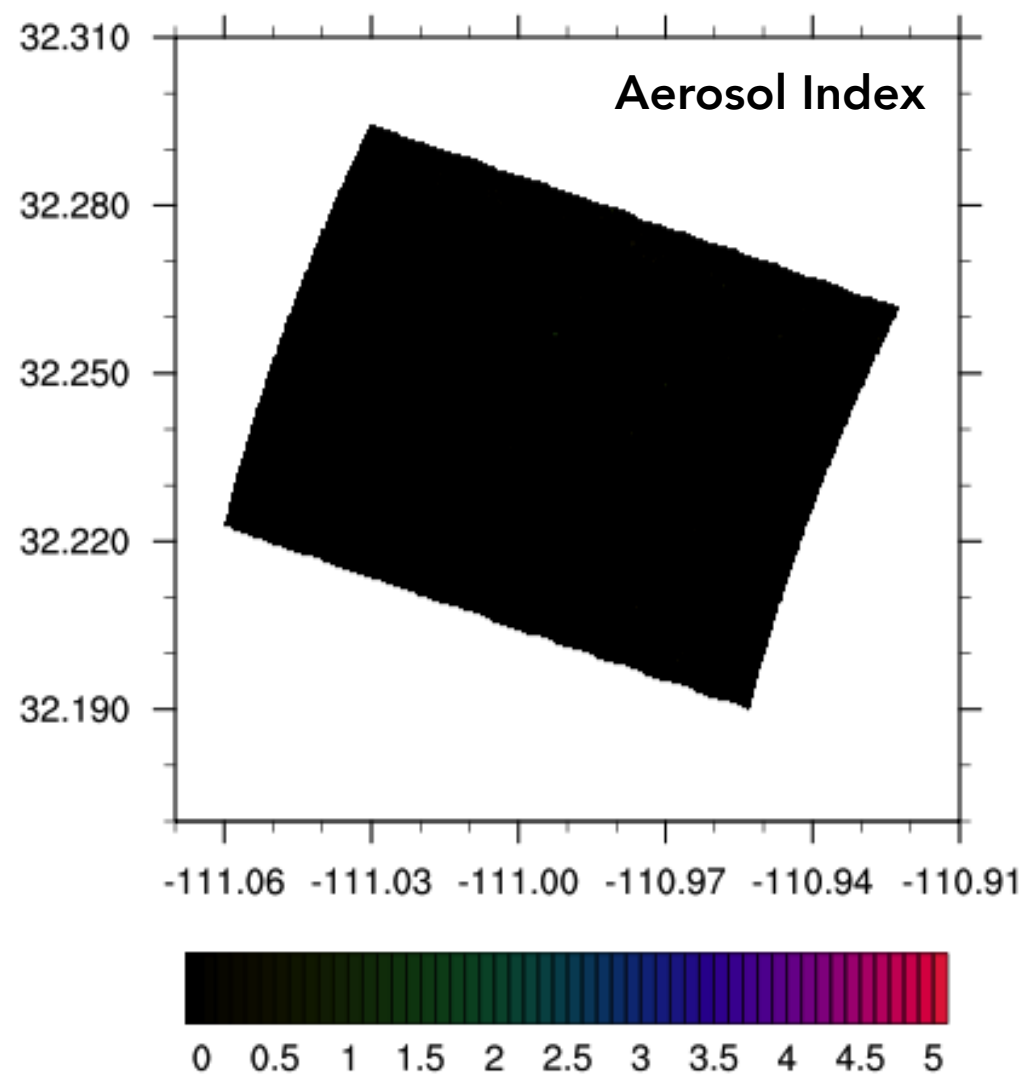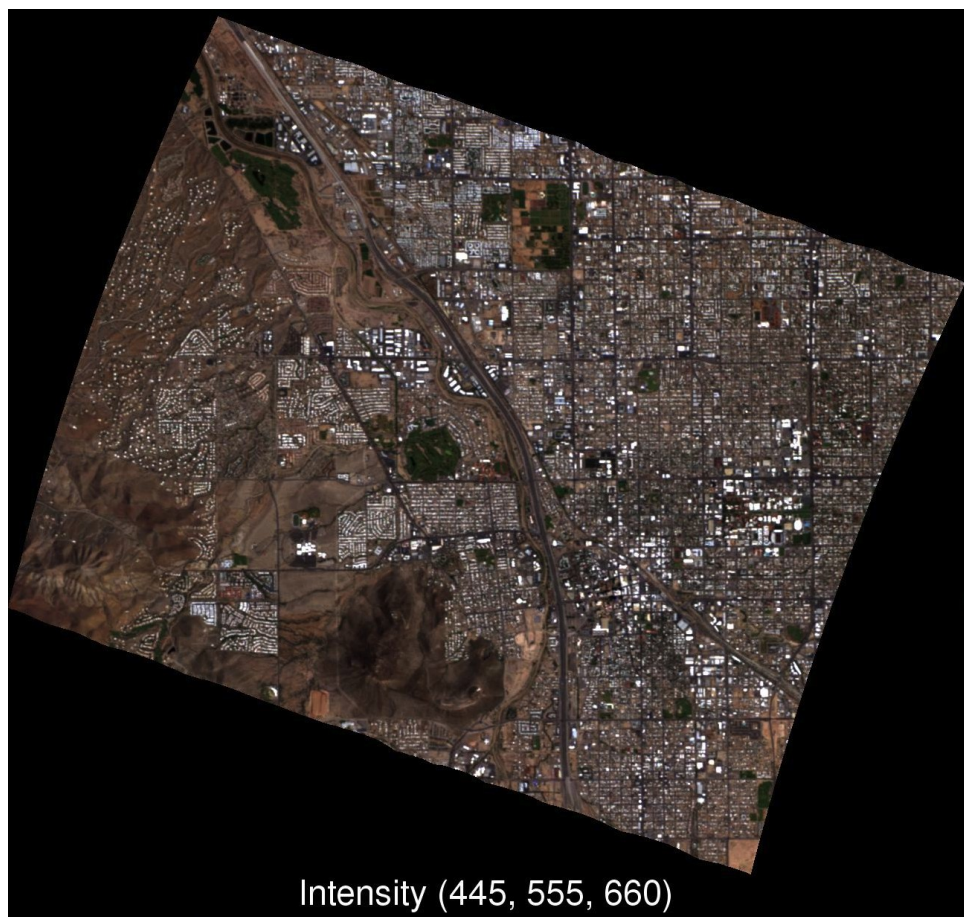# Computation of a "pseudo-Aerosol Index"

AirMSPI has <u>355nm and 380nm bands</u>, which roughly compare to OMI/Aura 340/380 nm bands, enabling computation of an "Aerosol Index":

$$A.I. = -100 \times [\log_{10}(I_{355}/I_{380})_{meas} - \log_{10}(I_{355}/I_{380})_{calc}]$$
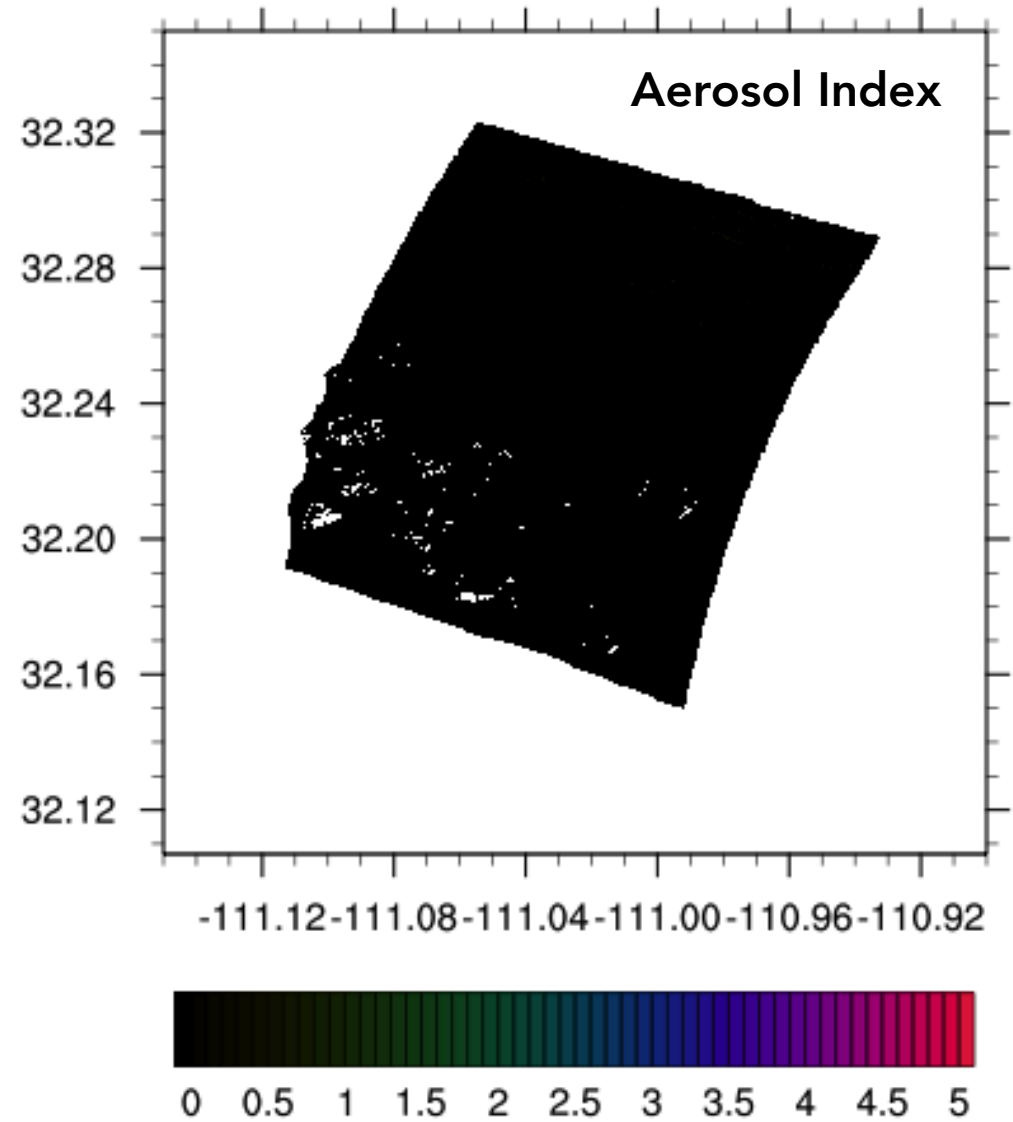
Field-based proxy for AOD, without needing to do computationally expensive RT retrievals

Utilize oblique angles (58.9° aft); screen for clouds using 660 and 865nm; smoke → AI > 0.5
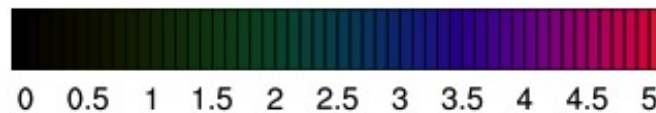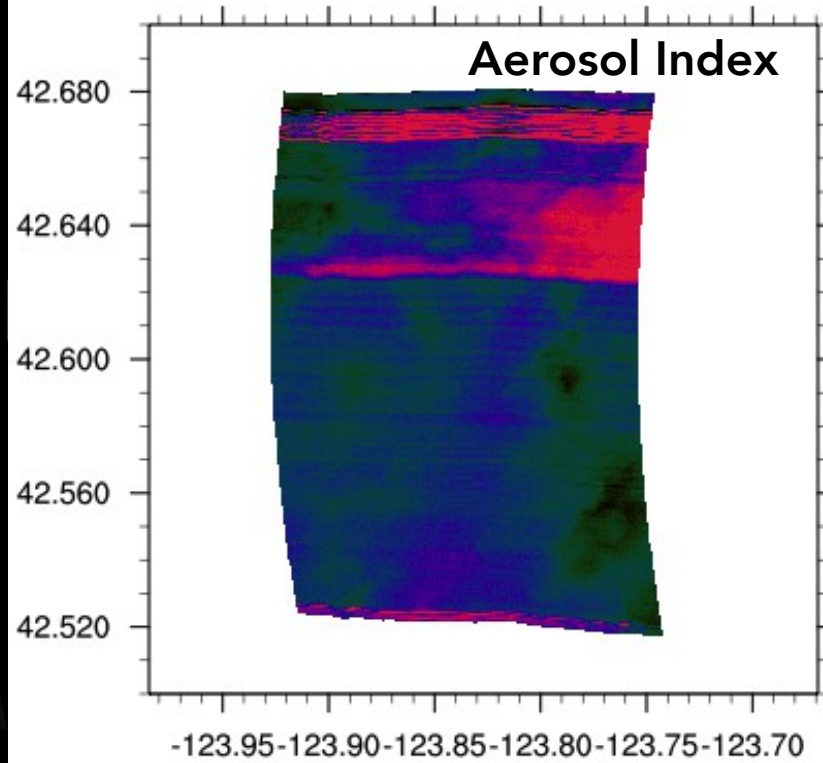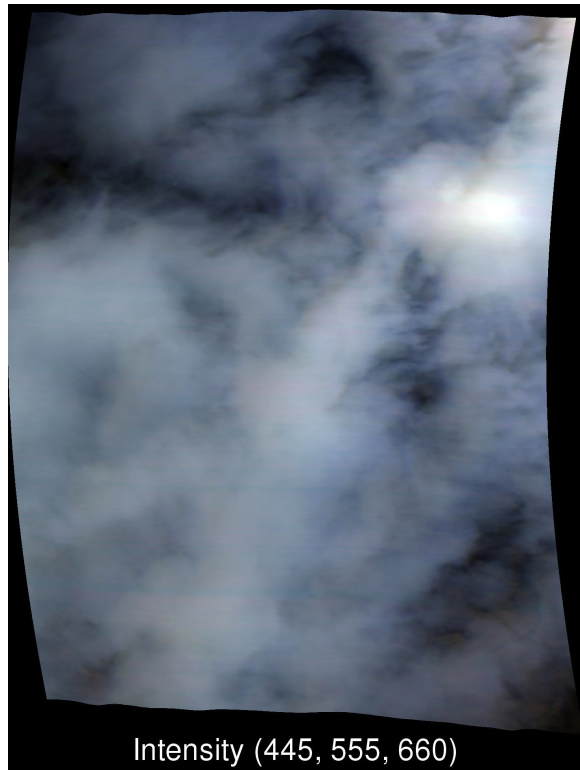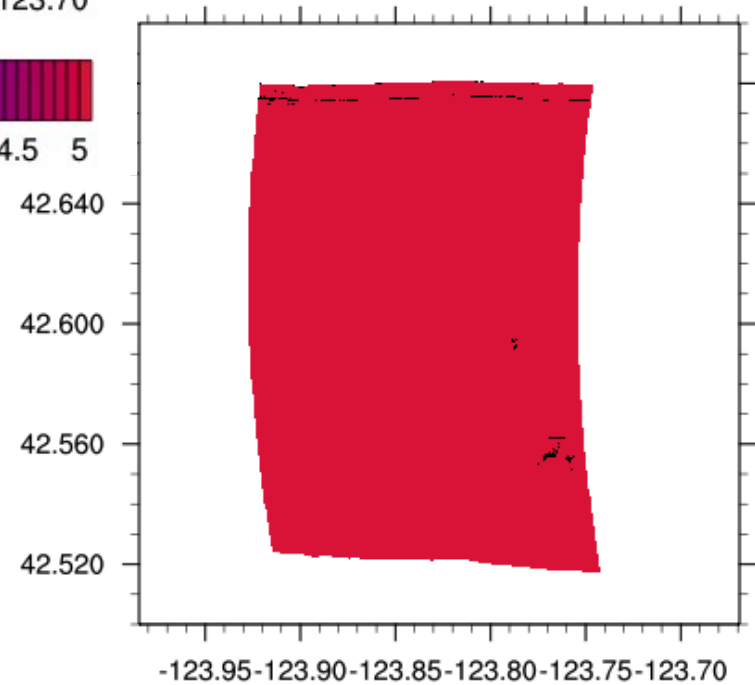
Tucson – no aerosols

Intensity (445, 555, 660)

Aerosol Index

Tucson – no aerosols (58.9° aft)

Intensity (445, 555, 660)

Aerosol Index

32.32
32.28
32.24
32.20
32.16
32.12

-111.12 -111.08 -111.04 -111.00 -110.96 -110.92

0   0.5   1   1.5   2   2.5   3   3.5   4   4.5   5

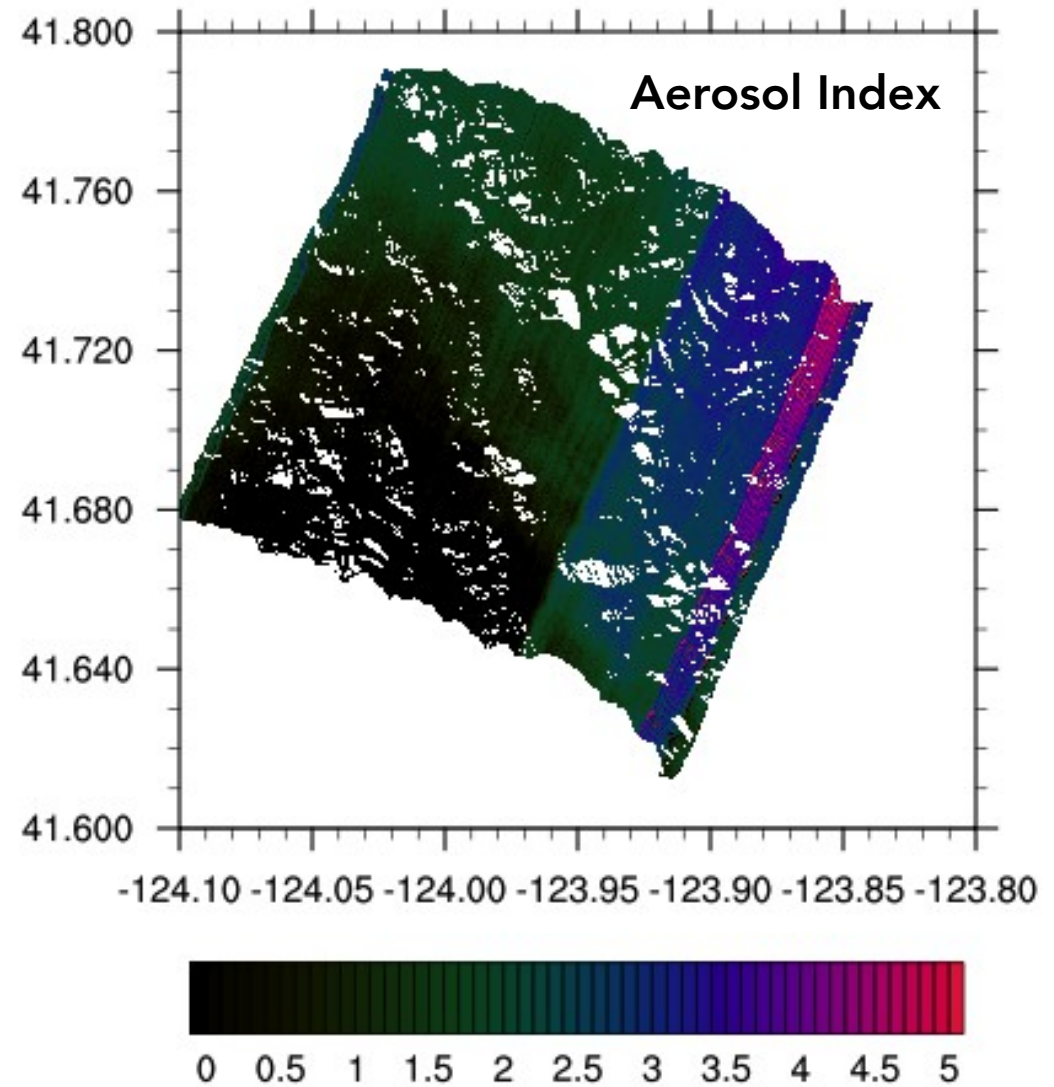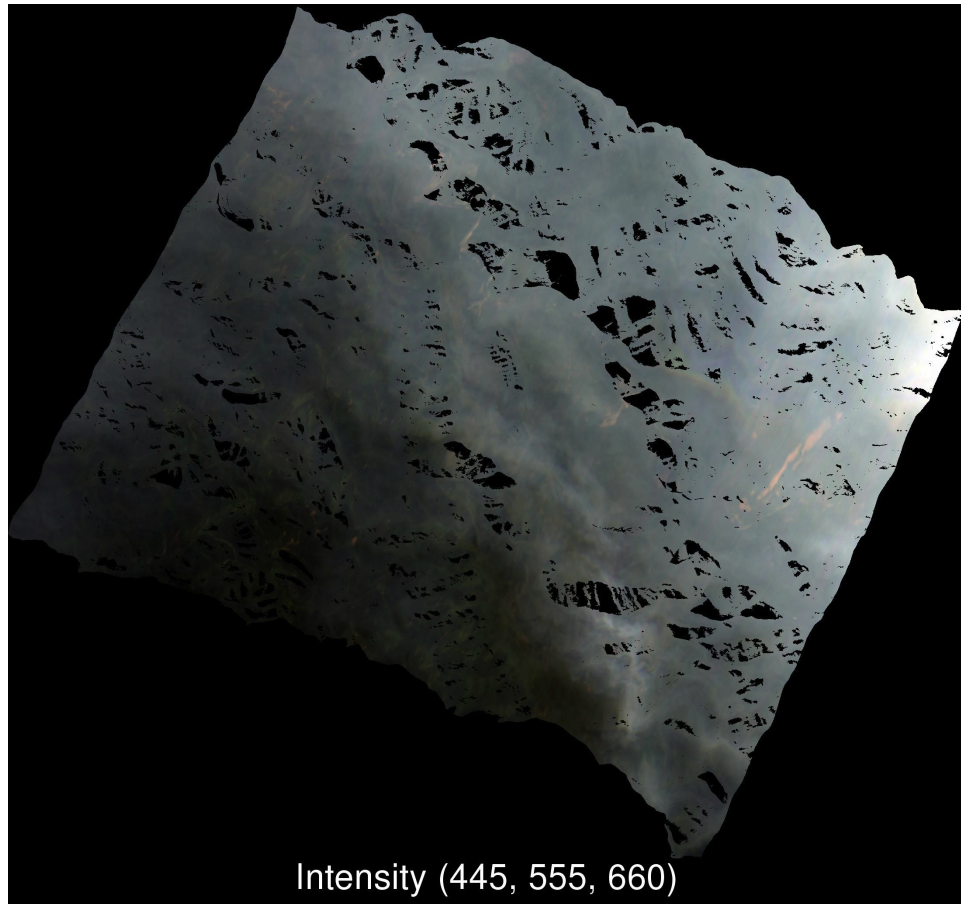# Kalamath Mountains – thick smoke (58.9° aft)

Intensity (445, 555, 660)

Aerosol Index

Smoke = pink,
No smoke = black →

Crescent City – THIN smoke (Nadir)

Intensity (445, 555, 660)

Aerosol Index
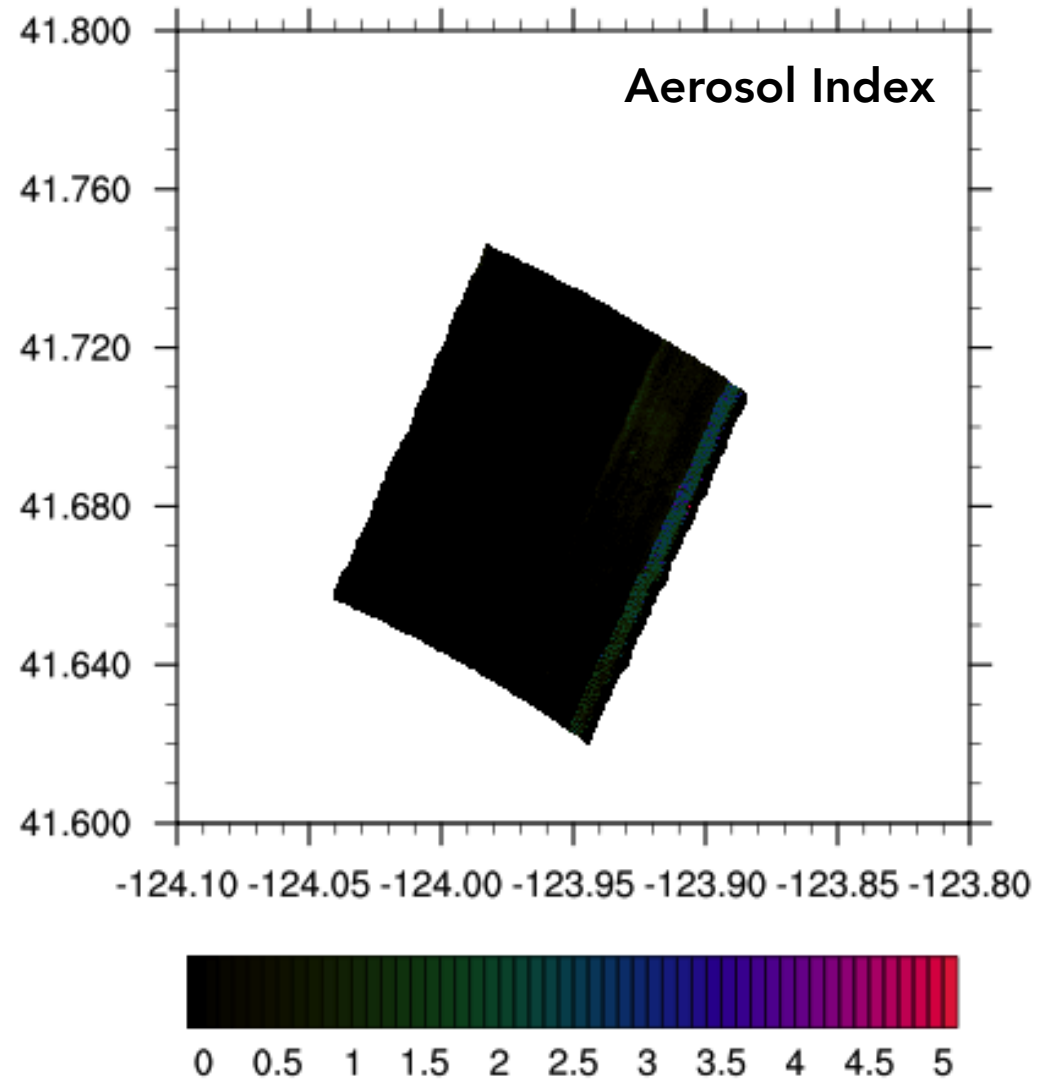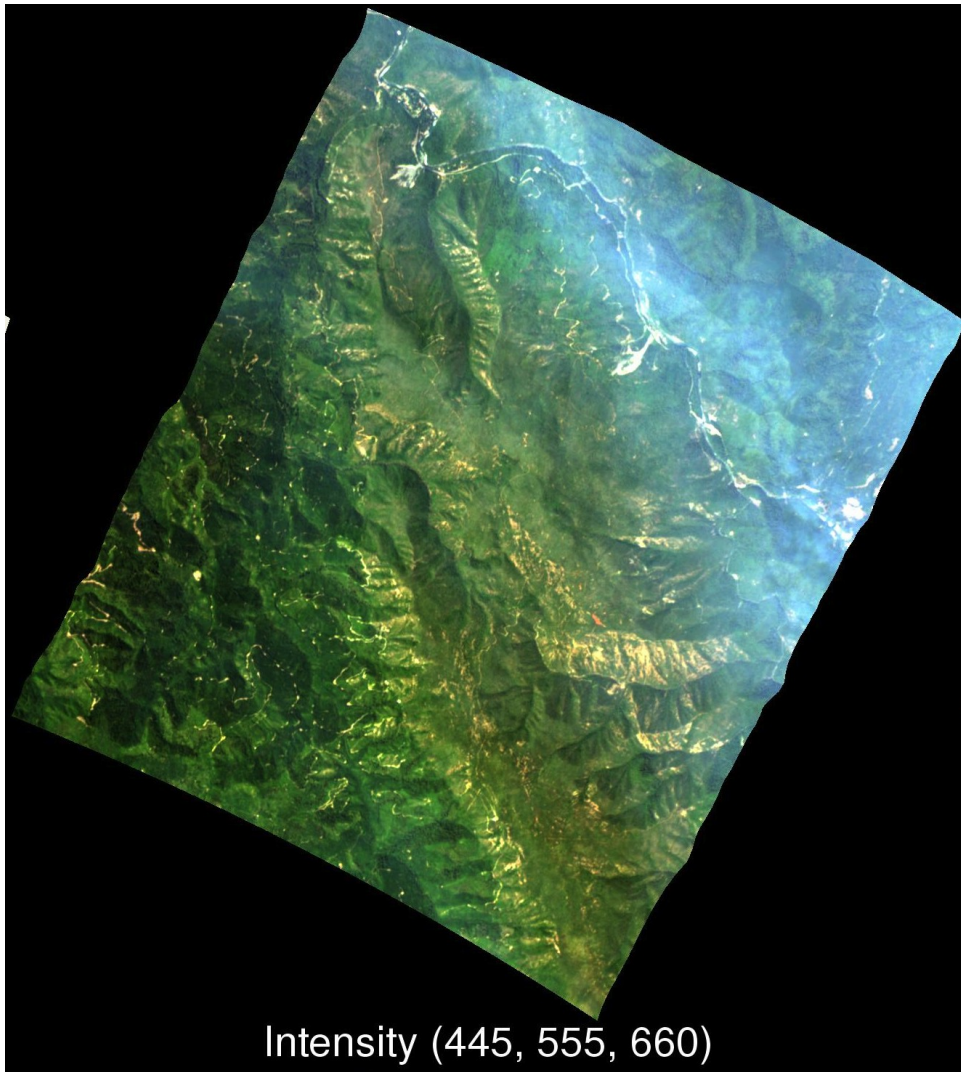
Crescent City – THIN smoke (58.9° aft)

Intensity (445, 555, 660)

Aerosol Index

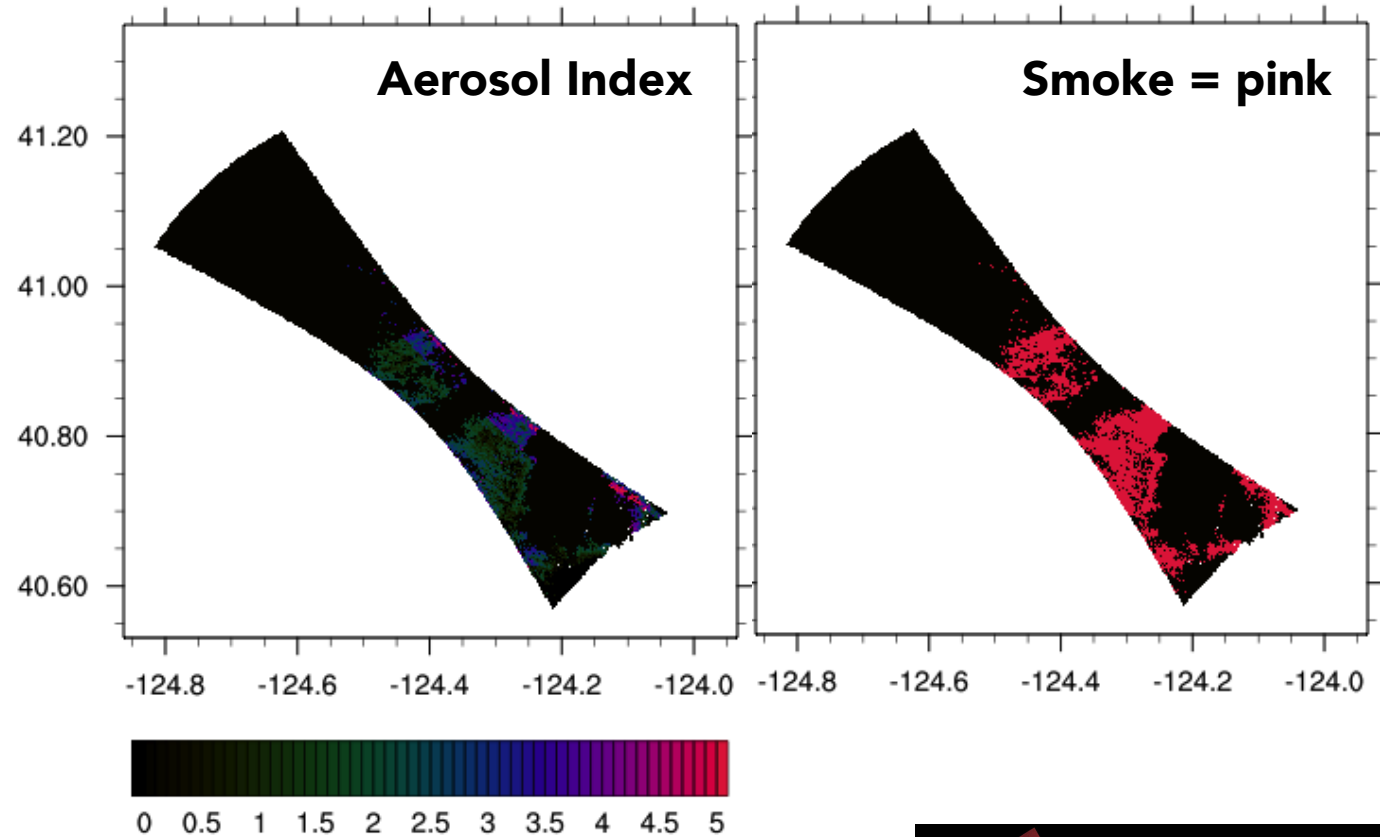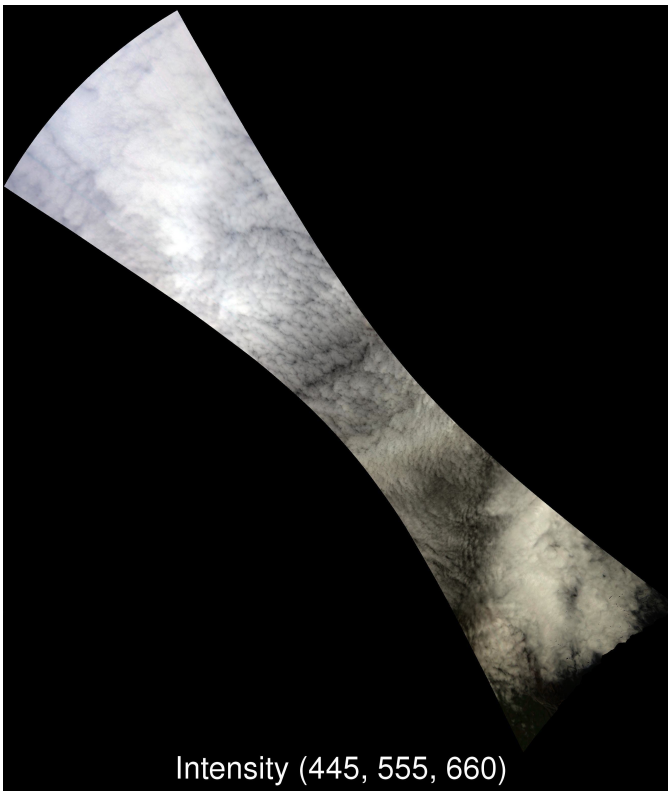# Crescent City – THIN smoke (nadir v. 60A)

Smoke = pink,
No smoke = black
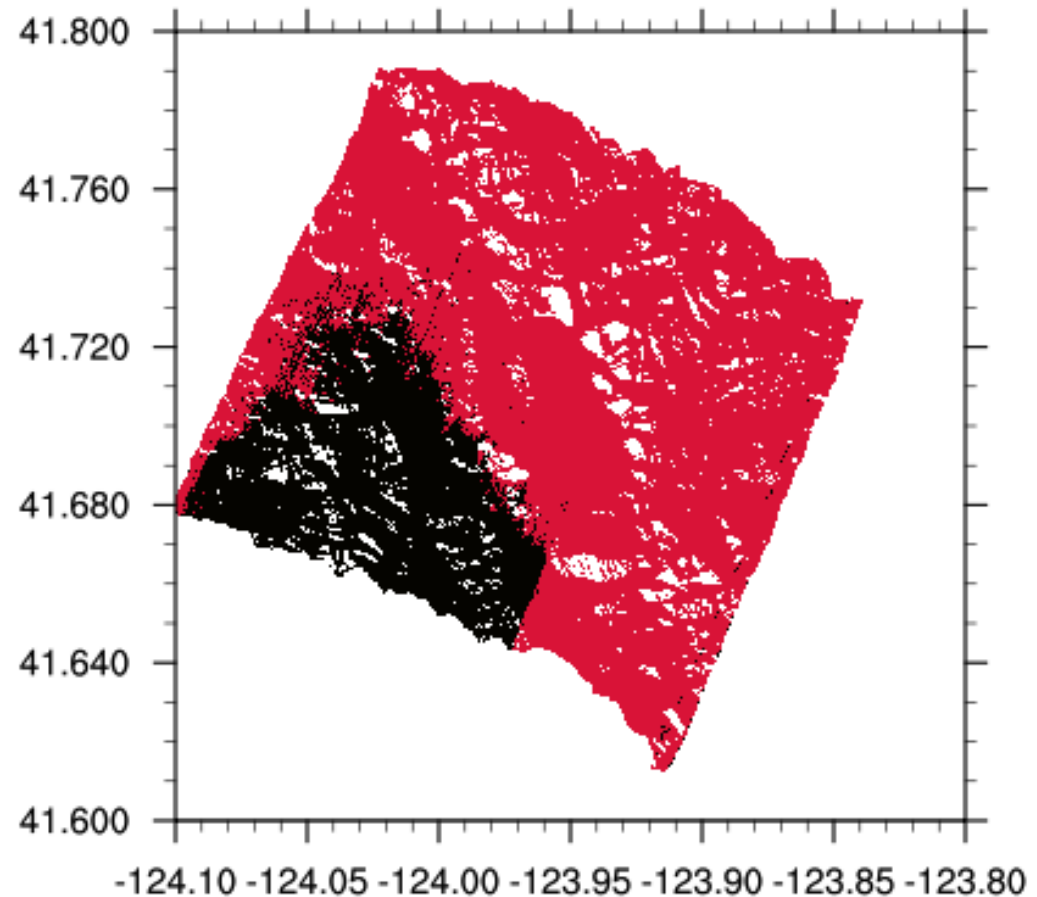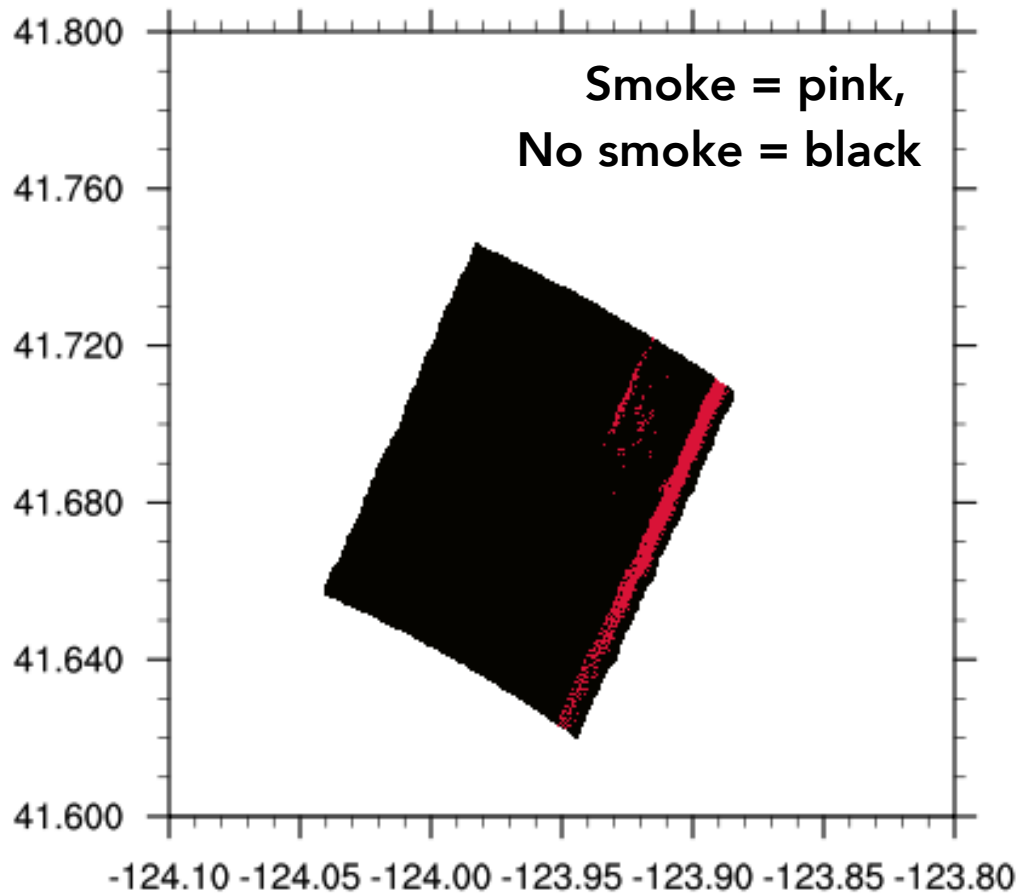
"SWEEP" Mode – smoke OVER cloud

Intensity (445, 555, 660)

Aerosol Index

Smoke = pink

Smoke over cloud is especially interesting when in principle-plane – can see cloud bow →
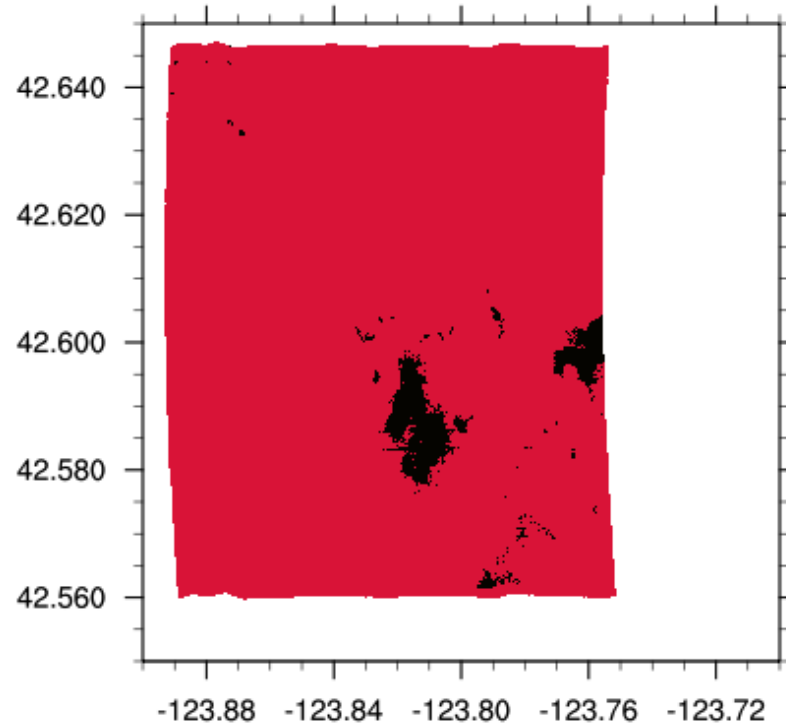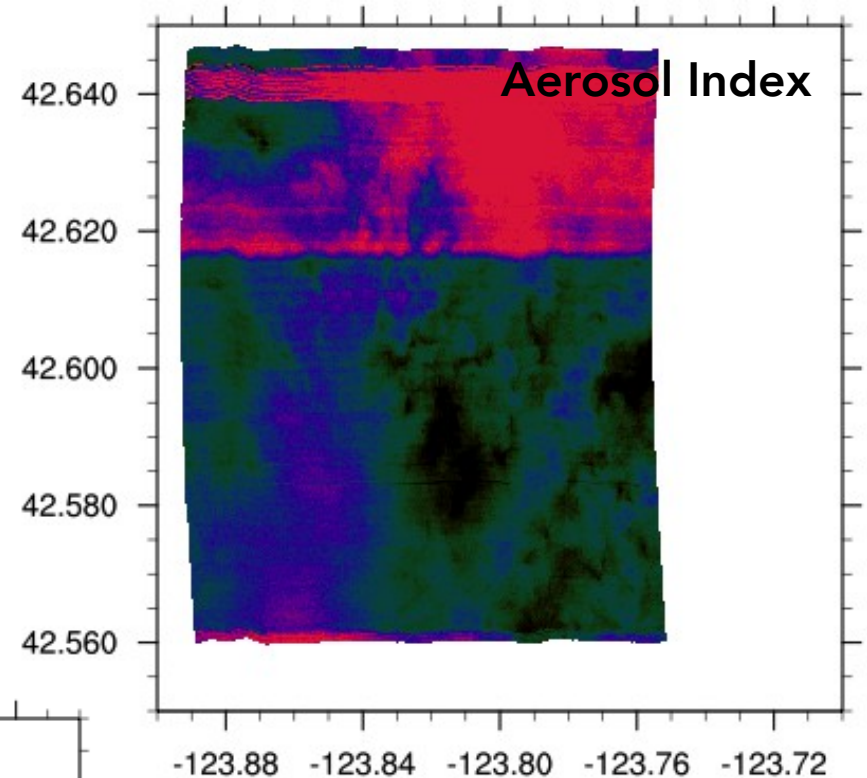

DOLP (470, 660, 865)
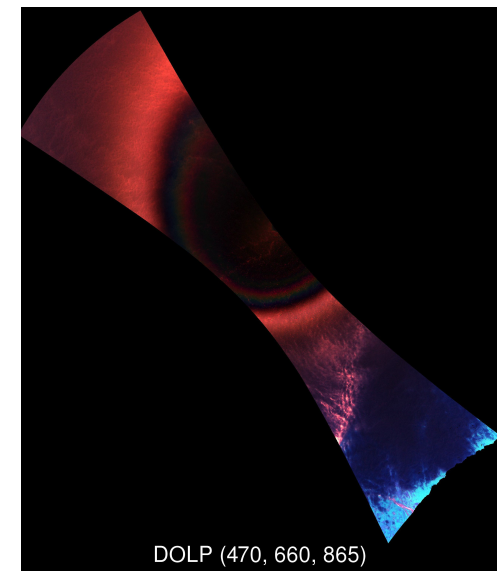
NEXT STEPS

Tomorrow is a big "fire flight" over the Mississippi Valley (August 19 was a "transported smoke" flight over the Central US)

Use our algorithm to quickly assess the presence, location and relative thickness of smoke in proximity to clouds and other features

Kalamath Mountains – thick smoke (nadir)

Aerosol Index

← Smoke = pink,
No smoke = black